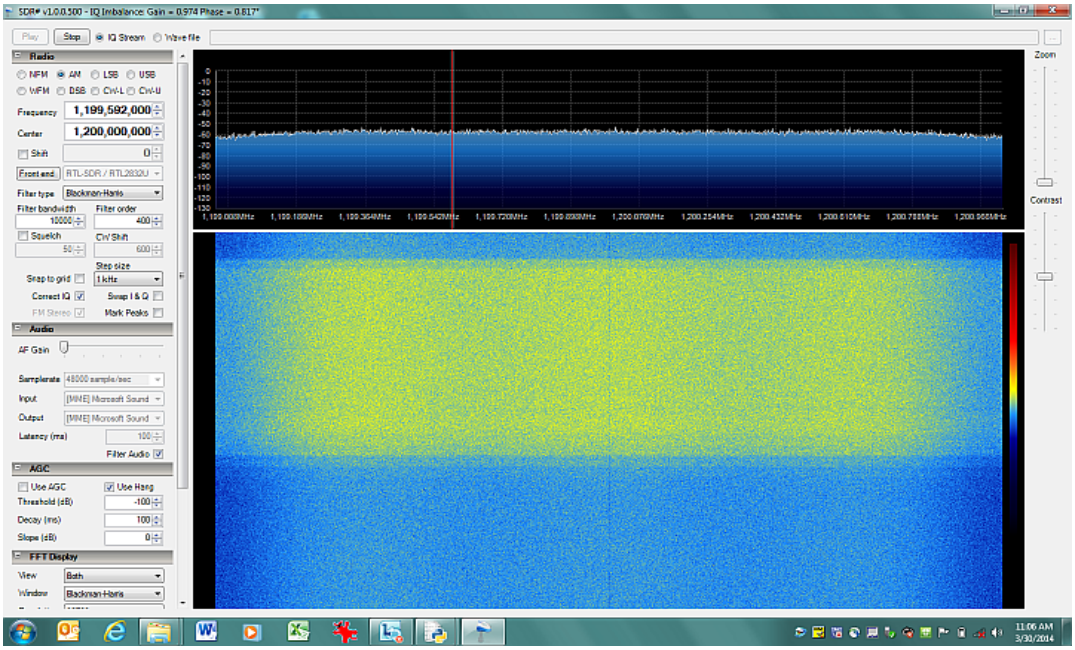
<<PREVIOUS - HOME - CONTENTS - NEXT>>
RADIO ASTRONOMY INDEX - NEW

Itty Bitty Radio Telescope
Observing the Sun at 12 GHz



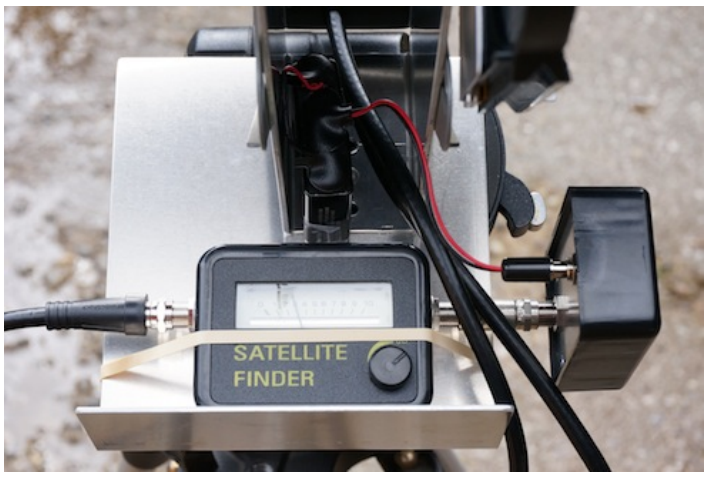
Itty Bitty Radio Telescope YouTube Video

- NooElec DVB-T+DAB+FM (R820T) SDR receiver with SDR# V1.0.0.500 showing the solar radio emission.
- SDR is at 1.2 GHz center frequency and 2 MHz capture bandwidth.
- The yellow band in the bottom blue spectrogram window is the 6 dB rise in signal strength as the radio dish is moved across the Sun.
- The blue bottom spectrogram window vertical axis is time and the horizontal axis is frequency.
- The Satellite Finder and power supply is connected to the first LNB output.
- The NooElec DVB-T+DAB+FM (R820T) SDR receiver is connected to the second LNB output
- Click on the above screen for full resolution screen capture.
- The above screen capture was the first time test of the Itty Bitty Radio Telescope with the SDR.

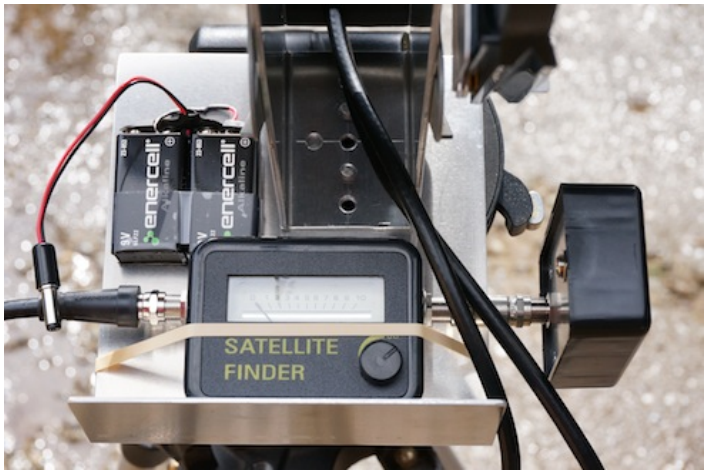
Itty Bitty Radio Telescope Parts

- Amazon DirecTv 18-Inch Satellite Dish LNB 18
  - LNB Needs power from the receiver to work
  - Dual output for two receivers
    - LNB output 1 to the Satellite Finder Meter For Directv
    - DC power is provided to the LNB output 1.
    - LNB output 2 to the DVB-T+DAB+FM (R820T) SDR receiver
      - Tuning range 950 MHz to 1.45 GHz
      - 2+ MHz capture bandwidth
      - Center frequency set to 1.2 GHz
    - LNB output 2 does not have DC voltage on it.
    - Therefor, no need for DC blocking adapter to the SDR receiver
  - LNB input frequency: 12.2 to 12.7 GHz
  - LNB output frequency: 950 to 1.45 GHz
  - Noise Figure: 1.1 dB, Max
  - Gain: 50 to 62 dB
  - LO frequency: 11.25 GHz, +/- 2 Mhz
- Amazon Satellite Finder Meter For Directv
  - Needs power from the receiver input to work: 13 ~ 18 VDC
  - Light behind meter in on when powered
  - Sound and meter for signal detection
  - Frequency range: 0.95 GHz ~ 2.15 GHz
  - Input level Max: -10 dBm
  - Input level Min: -40 dBm
  - LNB Gain: 52~60 dB
  - Meter scale 0 to 10
  - Finder adjustment control

- The finder is adjusted to 1 for the sky overhead
- The finder reads ~2 for the Sun
- The finder reads ~5 for the ground & trees
- The finder reads ~5 for hand over LNB

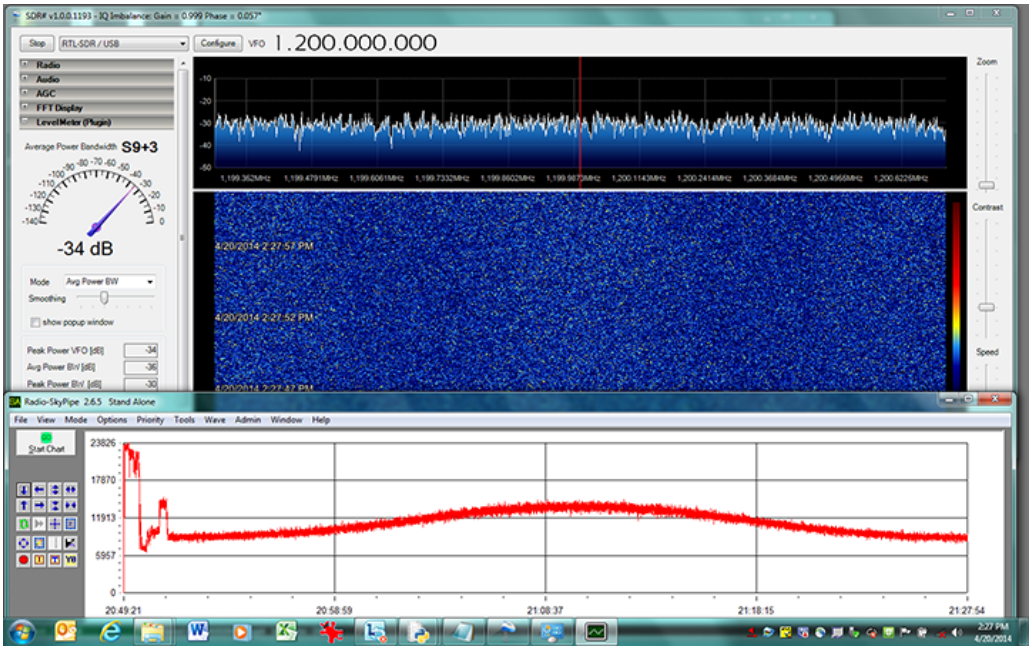


- Power Supply for LNB and Satellite Finder
  - Two 9 V batteries or
    - 14 V DC wall power supply with "M" connector or
    - Eight 1.5 VDC batteries in plastic holder with "M" connector
  - Power Supply box with two connectors
    - Radio Shack 273-0102 RF Choke, 100 microhenries
      - Blocks the RF from being shorted in the DC power source
    - Radio Shack 274-1582 Size M Panel-mount Coaxial Power Jack w/Switch
    - Radio Shack 278-0212 Panel-Mount F-61 Jack (2-Pack)
    - Radio Shack 270-1801 Project Enclosure (3x2x1")
    - The power for the Satellite Finder and the LNB is delivered by the RG6 coax. I made a small box Radio Shack 270-1801 Project Enclosure (3x2x1") with a F connector Radio Shack 278-0212 Panel-Mount F-61 Jack (2-Pack) and a M connector Radio Shack 274-1582 Size M Panel-mount Coaxial Power Jack w/Switch. DC power is connected to the M connector. The F connector is connected to the Satellite Finder to power it and the LNB. Inside the box the center of the M connector is connected to one end the Radio Shack 273-0102 RF Choke, 100 microhenries. The other end of the RF Choke is connected to the center of the F connector. The choke blocks the RF signal from the power source (two 9 volt batteries).
  - "F" male to "F" male connector
    - Attach power box to satellite finder receiver "F" connector



- Two 3 feet RG-6 coaxial cable with "F" connectors
  - One cable attaches the LNB output one to Satellite Finder LNB connection
  - Second cable attaches the LNB output two to the DVB-T+DAB+FM (R820T) SDR receiver

- Camera tripod with quick release plate and geared head



Drift scan of the Sun across the antenna beam

- Antenna Temperature of the sky is ~4 Kelvin.
  - Antenna Temperature by Wikipedia
  - Noise Temperature by Wikipedia
  - Antenna gain-to-noise-temperature by Wikipedia
  - Antenna Temperature by DG7YBN
  - Effect of the Sun Upon Antenna Temperature by Giddis, Albert R.
- Top window is SDR# Software v1.0.0.1193
  - With Level Meter Plugin
- Virtual Audio Cable (VAC) by Eugene Muzychenko
  - VAC input is SDR#
  - VAC output is Radio SkyPipe
- Bottom window with the red plot is Radio SkyPipe v2.6.5 by Jim Sky
  - The red plot is the amplitude of the audio output.
  - The plot time duration is from 20:49:21 UT to 21:27:54 UT on April 20, 2014.
  - The high peaks at the beginning of the plot is adjusting the audio gain.
  - The increase in the middle of the plot is the Sun moving across the antenna beam.
- Windows 7 Dell Latitude E6400 laptop

LINKS

Itty Bitty Radio Telescope

- NRAO What is it? What can it do?
- NRAO Procedure for Making the Itty Bitty Radio Telescope
- JPL Telecon: Make an Itty Bitty Radio Telescope
- JPL How to make an IBT or Itty Bitty (Radio) Telescope
- "Itty Bitty" (Radio) Telescope Telecon by Sue Ann Heatherly

Amateur Itty Bitty Radio Telescope

- Itty Bitty Radio Telescope Basic Assembly
- An Introduction to the Itty Bitty Telescope by Mark Gibson
- Itty Bitty Radio Telescope by Rosliston Astronomy Group
- Very Simple, Simple, and Other Approaches by Joachim Koppen Strasbourg
- YouTube My itty bitty radio telescope first field test! by CosmicFissure
- IBT Radio Telescope AKA our Lil' GBT by Galactic Stickman
- YouTube LNB Alignment Check by Radio Astronomy (NRARAO)

© 1998-2014 David Haworth